

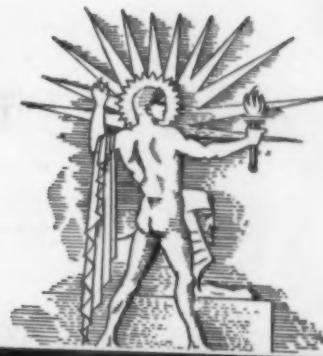
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# SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE.



DECEMBER 29, 1934

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See Page 410

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SCIENCE SERVICE PUBLICATION

## SCIENCE NEWS LETTER

VOL. XXVI



No. 716

The Weekly

Summary of

## Current Science

Published Every Saturday by

## SCIENCE SERVICE

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## DO YOU KNOW?

There are more Indians in Oklahoma than in any other state.

The art of making paper reached Europe as a consequence of the Moorish invasion of Spain.

Cleopatra's Needle in London is crumbling from the dampness and the sulphuric acid in London's fogs.

By heating the soil under hotbeds, plant growers find that geraniums root in 18 days instead of about 30.

A small boat found in a bed of turf, near Chervonny village in Russia, is pronounced about 2,000 years old.

Japan is in the situation of having a population about half that of the United States crowded into an area the size of California.

The fingerprint collection in the Department of Justice, with 4,700,000 prints of law-breakers, has been called an American Encyclopedia of Criminals.

Eight billionths of an ounce of radium in a pound of bath salts is too much radium for safety, the Federal Food and Drug Administration ruled, in banning a shipment of medicinal bath salts from France.

Negro slavery was introduced into the West Indies as early as 1502.

Mountain goats are increasing in Mount Rainier National Park, Washington.

Various species of rhinoceros were abundant in North America, millions of years ago.

The dojo or weather fish of Japan buries itself in the sand, leaving its head out, when storms approach.

New York has been the largest city in the United States from the time of the very first census, 1790, when it had 33,000 inhabitants.

A human being not only has two sets of teeth, which appear consecutively, but also two sets of hair, one of which vanishes soon after birth.

One primitive fungus which can attack the tissues of 37 different plants and numerous small animals prefers, among them all, dead onion roots.

Eight hundred prehistoric paintings found on the rocks in caves of the Libyan Desert are believed by the discoverer to be the work of Ethiopian Troglodytes, who have generally been thought legendary people.

## WITH THE SCIENCES THIS WEEK

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Can extinct species be brought back to earth? p. 411.

## PUBLIC HEALTH

# Health Outlook for 1935 Is Considered Favorable

## Cancer Control Seems Closer; No Influenza Epidemic Foreseen; Decline Expected in Tuberculosis

By DR. LOUIS I. DUBLIN, Past President, American Public Health Association, Third Vice-President and Statistician, Metropolitan Life Insurance Co.

**N**INETEEN thirty-four has been a good health year. My prediction made a year ago for Science Service has been fulfilled in virtually every particular.

We have had no serious outbreak of influenza. The deathrate from this disease has been about one-half of what it was in 1933, and, barring an outbreak in the final two weeks of December, we shall have, this year, the lowest influenza mortality rate experienced since 1921. The mortality from tuberculosis has continued to decline; and we in the Metropolitan Life Insurance Company are rejoicing because, this year, for the first time in the history of the millions of our industrial policy-holders of the white race, the tuberculosis deathrate has dropped below 50 per 100,000. Diphtheria has caused fewer deaths than ever before. While there has been a slightly higher mortality this year than last from the other principal infections of childhood, namely, measles, scarlet fever and whooping cough, the deathrate for all have remained low.

### Diseases of Aged Increasing

It is true that poliomyelitis was unusually prevalent in the late spring and during the summer in the western section of the country, especially in California; but this outbreak was brought under control more speedily than in previous epidemics, and the number of deaths per 100 cases was appreciably lower than has been observed in prior outbreaks of poliomyelitis. The crude rates for heart disease, cancer and diabetes have risen, as we expected they would, because of the advancing average age of the population. We have had more fatal accidents both on the streets and in the factories. This reflects improved economic conditions. More persons are employed this year than last and more are thus subject to the hazards

of industry; motor vehicle traffic, both pleasure and commercial, has increased on our highways, and this automatically has raised the chances of automobile fatalities.

### More Pneumonia

The only important development for which we were not prepared was a sizeable increase in the deathrate from pneumonia—in spite of the fact that there has been less influenza. This is a most unusual phenomenon, as high deathrates from these diseases ordinarily go together. It is clear that relatively few of the fatal pneumonia cases during 1934 were of influenza origin. The unusually cold weather of last winter doubtless played an important role, although it is true that even in the warmer months pneumonia mortality has been considerably higher this year than last. Whatever the cause, the increase in deaths from pneumonia is unmistakable.

Taken altogether, however, health conditions have held up very well in 1934 in spite of the fact that there are still millions of unemployed. I would not be surprised to find the final figure, when it becomes possible to calculate the deathrate for the completed year accurately, pretty close to that of 1933, when it was the lowest on record.

The prospects for 1935, in my judgment, are very good. There are no unfavorable signs on the horizon. The new year is not likely to be what we call "an influenza year." Past experience has been that a peak in the mortality from this disease is reached every third year. Inasmuch as the last severe outbreak occurred early in 1933, I hardly expect that we shall be faced with another in 1935. Of course, much is still unknown about the periodicity of epidemics; and weather conditions, always unpredictable, may be an important influence.

Diphtheria, I believe, will continue to fall to lower and lower levels, because the campaign against it has been successful. This has been brought about, for



ANCIENT AMERICAN ALTAR

*The most famous of the abandoned Mayan cities in tropical America still yield secrets. At ruins of Quirigua, Guatemala, the Carnegie Institution last season found two exquisitely carved altars which were dedicated 1,400 years ago. Workers are shown unearthing one of these altars, which is decorated with the figure of a masked dancer in elaborate costume. (See SNL, March 31, 1934).*

the most part, by immunization against the disease, and interest in immunization continues strong. No single development in the entire public health field has been more widely acclaimed than the reduction—almost to the vanishing point—of the mortality from this former scourge of childhood. The other infectious diseases of childhood are now of comparatively little moment. Scarlet fever, for example, is likely to follow diphtheria into the rank of the utterly preventable diseases.

I believe that tuberculosis will continue to behave according to formula, that is, with every succeeding year we shall observe a reduction in the deathrate. We are nearing the end of the fight against tuberculosis. It is destined in a few years to rank among the minor causes of death—and the greatest reduction in mortality has taken place in the wage-earning population where the situation has always been the gravest. The big desideratum now is to provide bed care for open cases on a larger scale than ever before. There is a very spe-

cial need for this in depression years when there are many homeless consumptives. Measures to take care of the situation are receiving the attention of health officers and hospital authorities in many communities under the stimulation and financial assistance of the Public Works Administration.

There has been much progress in the field of preventive medicine in 1934. The high reward of the Nobel prize for the work of Drs. Minot, Murphy and Whipple, who developed the liver diet therapy for pernicious anemia, will help to save many lives and to stimulate similar researches into disease of defective glandular function and of metabolic disturbances. The remarkable discoveries of the Nobel prize winners have made physicians more alert in the detection of the disease, which makes for earlier treatment. Much promising work is already being done in the laboratories.

The largest opportunity, however, continues to be in the field of cancer control. Many contributions from skilled experimenters, published this year, indicate that the day is nearer when we may have a method available to discover the beginnings of cancerous growths and be enabled to stop them before much damage is done. It will pay us big dividends to keep such work going—and on a larger scale than ever before.

#### Cheerful Outlook

Altogether, health officers and health workers generally may be more cheerful than they were a year ago. With economic conditions improving, it should prove less difficult for public and private agencies engaged in public health to maintain reasonable budgets and thus to win back the losses of staff and facilities which resulted from the budgetary contractions of the last four years. Already, in 1934, there has been evidence of a slight improvement in the facilities available to health workers. Out of 32 states from which we have had reports, 12 had increases in health budgets in 1934 over 1933; and 42 out of 77 cities showed increased appropriations. With the program of the Federal government developing in the field of public health as one of its major items, it may be possible to make some very forward steps in bringing full-time health services to many rural counties where very limited facilities have until now been available.

I continue to be very optimistic on the outlook for the health of the people in the United States.

*Science News Letter, December 29, 1934*

#### ASTRONOMY

## New Brilliant Star Will Be Bright For Some Time

**N**OVA Herculis, newest stellar object in the sky is still exploding and getting brighter day by day. The new bright star visible in the northwestern sky directly after sunset and in the northeast immediately before sunrise is now brighter than the Pole Star—Polaris. (SNL Dec. 22). Its astronomical brightness, or magnitude, on December 22 was 1.4, with every indication of further increase to brighter than first magnitude. It may soon be exceeded in brilliance by only eight stars visible from the northeastern United States, namely Sirius, Vega, which is close to the nova, Capella, Arcturus, Rigel, Procyon, Altair and Betelgeuse.

Dr. Harlow Shapley, director of Harvard College Observatory, informed Science Service that observations communicated to him from Yerkes Observatory indicate that the star is still expanding. Its outer atmospheric shell is rushing outward at the rate of 102 miles every second.

While its present rate of expansion is over 350,000 miles an hour, it is much less than the expanding velocity of the star when first observed. At that time observations made at Cambridge University in England indicated Nova Herculis was rushing outward with speeds of about a million miles an hour.

The brilliant new star may prove to be "the most important of its kind that we have yet had," Dr. V. M. Slipher, director of Lowell Observatory, informed Science Service after making many photographs of its spectrum or rainbow spread of light.

He predicts that the nova will continue to be bright for some time before it undergoes the rapid fading typical of such temporarily brilliant stars.

The Lowell Observatory observations covered the spectrum from red to violet and show besides strong hydrogen series numerous other emissions, always having companion absorptions on violet edge of emissions.

"All emissions and absorptions are rather narrow," Dr. Slipher said. "Doubly ionized helium radiations are strong along with many other radiations.

"Particularly interesting is the fact

that this spectrum closely resembles that of Nova Aurigae in 1892 and remarkably matches spectrum of variable nebula NGC 2261. The Auriga Nova's light was exceptional and we called attention some years ago to its likeness to this nebula's light. That the light of these objects is now matched by Nova Herculis prompts me to suggest that we can expect the latter object to otherwise resemble the earlier nova and in particular that it will continue its maximum light phase some time before rapid fading typical of novae begins.

"These and other facts suggest Nova Herculis may prove the most important of its kind we have yet had. The quality of its light suggests more lasting qualities in this star than novae commonly possess.

"Fortunately, it has come when observers have good instrumental means and when the present highly effective light analysis affords high promise of definitely solving the long standing enigma of novae and at the same time doubtless we shall learn much regarding the equally important and puzzling variable nebulae.

"Fortunately this nova is so favorably placed that it can be observed all year. Indeed just now it can be observed twice daily, evening and morning. Such accessibility to continuous study is a highly important advantage with such objects because they are so temporary and, too, always doing something.

"Thus high hopes are held that this object will be the means of greatly advancing our knowledge of two of astronomy's most outstanding problems."

Later observations at Harvard and Yerkes show that the nova's spectrum was undergoing remarkable changes. From a close resemblance to the spectrum of the star Alpha Cygni, it changed two days later to resemblance to a later type star, Gamma Cygni.

Both Harvard and Yerkes spectra show that hydrogen emission and absorption lines are weaker, with titanium absorption increasing. These are changes that are as unexpected as they are peculiar.

*Science News Letter, December 29, 1934*

## GENERAL SCIENCE

# Scientists Cooperate With Government Through S. A. B.

## Chairman Tells of Problems Considered by President's Science Advisers; New Plan Works Effectively

By DR. KARL T. COMPTON, Chairman, Science Advisory Board; President, Massachusetts Institute of Technology.

THE Science Advisory Board, appointed by President Roosevelt on July 31, 1933, represents a new form of cooperation of the nation's scientific personnel with the government in its varied scientific services. It supplements and cooperates with the National Academy of Sciences and the National Research Council, which were established during the national emergencies of the Civil War and the Great War respectively, to aid the government, and which play an important role in the organization of the nation's scientific forces for increased effectiveness in ordinary times and particularly in times of stress.

The science Advisory Board has submitted to the President of the United States a report on its work from the date of appointment to September 1, 1934. While the details of this report can only be made public subject to release by the President, there is no impropriety in disclosing the general scope of the subjects which have engaged the study of the Board and its committees. Important among these subjects have been the program of the U. S. Weather Bureau, with particular reference to methods of weather forecasting and the cooperation of other governmental services; cooperation with a committee of railroad presidents to determine fundamental aspects of policy and organization, for insuring to the railroads the best contributions from modern science; questions of organization and program in the U. S. Geological Survey and the U. S. Bureau of Mines, with particular reference to the need for more adequate handling of mineral statistical information; re-definition of the functions of the U. S. Bureau of Standards, with detailed consideration of its program

and needs and particularly its method of cooperation with industry in the establishment of trade and commercial standards; a study of the surveying and mapping activities of the government distributed through 28 government bureaus, with particular consideration of efficiency in mapping and efficient service of mapping agencies to organizations which need maps for their operations; the formulation of a scientific basis for studies and administration of problems of land use, including soil erosion; preliminary studies of the chemical services of the government and also of certain features of a program for stimulation of new and preferably non-competitive industries.

In handling each of these and similar problems, the Board has established committees of prominent scientists and administrators who are pre-eminently competent in their respective fields, and including on each committee one or more members of the Board. These committees have carried on the detailed studies and formulated recommendations which have then been presented to the Board, forming the basis of the Boards' reports to the Department Secretaries or other administrative officers of the government. This procedure has worked effectively and rapidly, and the response of leading scientists and engineers to requests by the Board for their services on these committees has been uniformly gratifying and has demonstrated the eagerness and effectiveness with which such men are willing to devote their time and energy to government service for the sake of the most efficient operation of the government services which relate to their particular fields of interest. These committees, as well as the members of the Board, have served entirely without compensation.

Science News Letter, December 29, 1934



### WATER OVER THE HILL

Water from the Owyhee River in the eastern Oregon project of the U. S. Bureau of Reclamation is carried across numerous canyons by giant siphons over ten feet in diameter, like that shown above. The scene is the Sniweley siphon over 900 feet long and completed arc welded throughout its length. Photograph by the Lincoln Electric Co.

## ASTRONOMY

# 1935 Brings Seven Eclipses

**Sun is Darkened First on January Fifth, and Last of These Events Occurs on Christmas; None Important**

By JAMES STOKLEY

THE CHIEF claim of the month of January to astronomical interest, as far as can be predicted in advance, is that it brings two eclipses. And in this way it starts out the year well, for 1935 will have seven eclipses, the greatest number possible in a single year. But the two January eclipses are not of great importance, for one is a partial eclipse of the sun, and the other, though total, is of the moon.

The first eclipse is that of the sun, and it occurs on Saturday the fifth. There is no land from which it will be seen as its region of visibility will be included in a small area in the South Pacific Ocean, to the southwest tip of South America. Even if any hardy navigators should be in that region they would probably not notice anything strange about the sun, because when the eclipse is at its maximum, the moon will hide but a thousandth of the sun's diameter. A telescope would be needed to reveal the nick that will be apparently made in the edge of the sun. However, small as this is, the moon does really come partly between the sun and the earth, and so it rates as an eclipse, though one of the smallest on record.

Saturday, Jan. 19, is the date of the moon eclipse which is total, with the moon becoming entirely enveloped in the earth's shadow. But this also will not be visible from any part of the United States, though it will be seen over most of Europe, Asia, Africa and Australia. However, though a lunar eclipse is interesting to watch, it has little scientific value and astronomers generally go to no great pains to observe one.

#### Largest Possible Number

Not since 1917 has there been a year of seven eclipses, the largest number that can occur in one calendar year. An eclipse of the sun must occur at new moon, when the moon is between the sun and earth. Generally, the three bodies are not quite in line, and then the shadow of the moon sweeps

through space north or south of the earth.

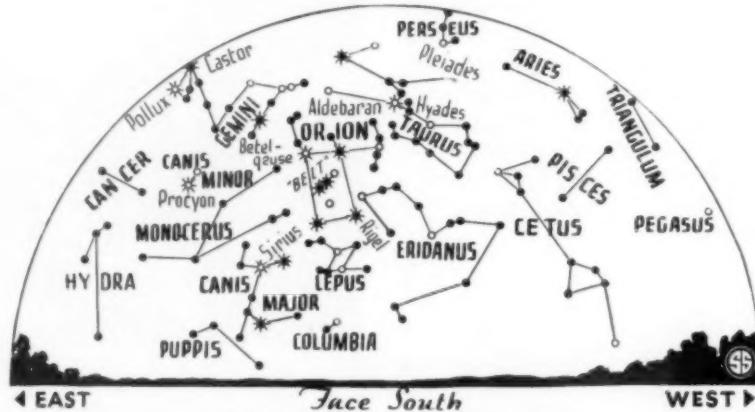
This is because the path of the moon does not exactly coincide with that of the sun, but is inclined to it. At two points, called nodes, these paths cross. Twice each year, therefore, the sun has to pass one of the nodes of the moon's orbit, and always, at or near each of these times, there is at least one eclipse of the sun.

If there happen to be two times of new moon with the sun passing the node about half way between them, then there will be eclipses at each of them. And at the full moon just half way between them, the three bodies, earth, moon and sun, will again be in line and there will be a total eclipse of the moon.

#### Second in February

This is what occurs this month, for the second solar eclipse occurs on Sunday, February 3. This eclipse will be visible all over the United States, but west of the Rockies the eclipse will already have started when the sun rises. Where it is at its maximum the moon will cover nearly three-fourths of the sun's diameter. Thus there will be no doubt about there being an eclipse, as the sun's light will seem of a peculiar yellowish color, and when seen through

#### \* \* \* SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



*Sirius, the dog star, with the bright belt of Orion above dominates the southern skies this month.*

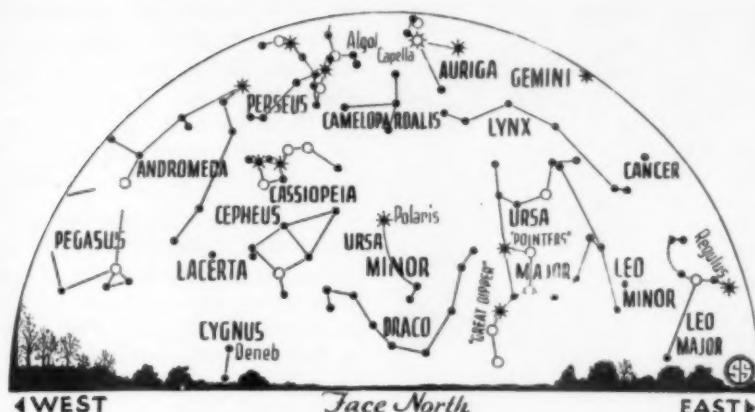
a smoked glass, it will look like a crescent. In the eastern part of the United States it starts about 10 a. m. and lasts for about two hours, so the preachers will have rather strong competition if the weather is good.

Again in July the sun will cross the node of the moon's orbit, and again there will be three eclipses, two of the sun and one of the moon. First will be a partial eclipse of the sun, visible in Northern Europe, Asia, Greenland, Iceland and around the north Pole. On the night of July 15, the moon will be totally eclipsed, and this will be seen over the entire United States. On July 30, the sun will again be partly covered, this time as seen from the South Atlantic Ocean.

#### The Seventh

Thus six eclipses are accounted for. But the nodes of the moon's orbit are not fixed on the sun's path, as they slide westward around it once in about nineteen years, and hence the sun returns to a node in some 346 days, instead of a full year. Thus, if the first of one pair of solar eclipses occurs early in January, we may have eclipses at three separate times of the year, the last being in December.

This occurs in 1935, and the fifth solar eclipse comes on Christmas day. This will not be partial, but annular, with the moon coming squarely in front of the sun, but failing completely to cover it. This eclipse will occur near the time of the month when the moon



## GUIDEPOST TO THE SKY

Low in the northeast, with the handle hanging down, is the familiar dipper, convenient guide for locating other constellations in that region of the heavens.

is farthest from the earth, and hence of smallest diameter, so that its apparent diameter will be less than that of the sun. The result will be that from a region near the South Pole, the dark disk of the moon will be seen surrounded by a ring of sunlight. In the southern tip of South America and in the south Atlantic and Pacific Oceans, this will appear as a partial eclipse.

What 1935 gains in quantity of eclipses it loses in quality, as so often is the case, because not one of the seven will be of such a character as to attract astronomers to remote parts of the earth to study it. The year 1936 with but four eclipses, two of the sun, will be much better, for a total solar eclipse on June 19 will be visible over a path beginning in Greece, and crossing Siberia, Japan and the Pacific Ocean. Before the end of 1935 many astronomers will have completed their preparations for expeditions.

## Occultations Coming

Some other interesting events will take place during 1935 in the form of eclipses of stars and planets, more accurately called "occultations." On May 5 the moon will pass in front of, or "ocult," the planet Venus, an event that will be seen all over the United States except in the far west. In the early morning hours of May 19 it will do the same to the bright star Antares, in the constellation of Scorpius. Antares will again be occulted on July 12, and then again the western states will be left out of the picture. But they will be recompensed on the night of October 31, when the planet Mars will be occulted, for this will be visible only in the west.

No planets will be well placed for observation during the whole of the January evenings, but low in the west just after sunset will be seen the brilliant Venus. During the spring and early summer it will rise higher becoming the most brilliant object in the evening sky, except for the moon. In about a month or so Mars will come into view in the evening, and Jupiter will follow in the spring.

## Saturn and Mercury

In the early part of January Saturn can be glimpsed low in the western twilight, but he is soon to disappear as he passes behind the sun. In the summer he will return to the evening sky. Mercury may also be seen briefly in the west after sunset about February 1, May 26 and Sept. 23, the dates when he is at his farthest to the east of the sun, and sets the longest time after it.

Though the sun is now so low in the sky, this month the earth is closer than at any other time of the year. On the second we are at perihelion ("closest the sun") and about 91,345,000 miles away, or more than three million miles closer than we shall be in July. On January 6 the earth is farthest from the moon (at "apogee") with a little less than 256,000 miles separating us. Perigee, the time of closest approach, comes on Jan. 22, when the two bodies are 226,000 miles apart. The moon is new on Jan. at 12:20 a. m. E. S. T.; at First Quarter on Jan. 11 at 3:55 p. m.; Full on Jan. 19 at 10:44 a. m.; at Last Quarter on Jan. 27 at 3:59 p. m.

More bright stars are now visible in the evening skies than for months. Dominating these groups, in the south,

is Orion, the great Warrior of the sky, easily recognizable from the three stars in a row that form his belt. Below and right of the belt is Rigel, in one leg, and at an equal distance opposite appears Betelgeuse, only slightly inferior in brightness. Above Orion is red Aldebaran, marking the eye of the bull, Taurus, which is supposed to be charging at Orion. This star is in a V-shaped cluster of stars, the Hyades, that outline the animal's face. West of the Hyades, almost overhead, is another famous cluster of stars, the Pleiades, of which most people can see six, forming a tiny dipper, that should not be confused with the real "little dipper," to the north, with the Pole star at the end of the handle.

## Bright Jewel

Below Orion is the brightest star in the sky, Sirius, the dog-star, marking the jewel in the collar of Canis Major, the greater of the two dogs which accompany the warrior. This is the closest of the stars that can be seen from most of the United States without benefit of telescopes. Its light, travelling at the speed of ten million miles a minute, takes about nine years to get across to us. The other dog is a little higher and farther east, and in this group, Canis Minor, we find the star Procyon. Still farther around, to the north and higher, is Pollux, one of the twins, Gemini. Just above Pollux is Castor, and the figures of the two boys are formed by the stars just to the south. A second magnitude star, Propus, above Procyon, forms the foot of Pollux.

## Auriga Overhead

Auriga, the charioteer, is almost overhead in the eastern sky, seen as an irregular pentagon of stars and in it is the brilliant Capella. The Great Dipper can be seen low in the northeast, the handle hanging downwards, and above the Pointers, the two stars at the side of the bowl farthest from the handle, which indicate the Pole star by the direction of the line joining them. Quite low in the east, where it does not fully arise until later in the evening, is Leo, the lion. First can be seen the animal's head, formed by a hook-shaped group of stars sometimes called the Sickle. The star Regulus is at the end of the handle of the Sickle.

In the southwest can be seen the figure of the whale, Cetus, with the second magnitude star Deneb Kaitos near the

horizon marking his tail. A quadrilateral of fainter stars above marks his body and still higher is his neck and head. In the neck you may now be able to see the star Mira, but if you had looked at this same part of the sky a few months ago no star would have been visible. Mira is a famous long period variable star, usually too faint to be seen without a telescope, but every eleven months increasing to naked eye visibility. Directly west appear the four stars that outline the corners of the Great Square in Pegasus.

## PHYSICS

## Revolutionary Method of Power Transmission Urged

### Chairman of Science Advisory Board Proposes Use Of Electrostatic Generator With Vacuum "Pipes"

ELCTRICITY generated by enormous disks spinning in vacuum and "piped" unlimited distances along vacuum surrounded rods, carrying cheap energy from great water power developments or coal and oil fields to the centers of population, is the possibility held out by Dr. Karl T. Compton, chairman of the Science Advisory Board, in a research project recommended to President Roosevelt for federal financing.

This revolution in both the making and the transporting of electricity has been in the making for the last five years. Young Dr. Robert J. Van de Graaff is the scientist mainly responsible. The 10,000,000 volt electrostatic generator built by the Massachusetts Institute of Technology at Round Hill, Mass., is the first step toward an electrostatic generator suitable for commercial power production. The transmis-

The upper one is Alpheratz, in Andromeda, and the three lowest ones are part of the winged horse, Pegasus. Just north of Andromeda is the W-shaped group representing her mother, the queen Cassiopeia. Low in the northwest can be seen Deneb, all that remains of Cygnus, the swan, visible for the past few months.

The maps picture the January skies as seen at 10 p. m. on the first of the month, 9. p. m. on the fifteenth, 8 p. m. on the thirty-first.

*Science News Letter, December 29, 1934*

sion system proposed, an airless pipe with a rod running through it, has probably been tested but no experimental results have been announced.

Dr. Compton in a description originally prepared over a year ago and just made available as a part of the Science Advisory Board report proposed "a radically new scheme for electric power transmission" because present methods of transmitting electrical power are limited by practical reasons of efficiency, complexity and cost to about 250 miles.

The new system should be "cheaper to install than present systems and should be capable of transmitting power to unlimited distances without appreciable loss."

It is known that there is some hope that the Tennessee Valley Authority with its large power developments may benefit from this radically new development. Several hundred thousands of dollars would finance a serious effort to develop the new scheme to the stage of useful application. The project is described as "planned and ready to start under competent supervision on short notice."

Instead of alternating current that the now-standard electromagnetic generators produce at high voltage, the new proposed generators would give out direct current at about a million volts.

The giant disks of the electrostatic machines would be surrounded by

vacuum because of the necessity of preventing tremendous sparks that might wreck the whole equipment if they were allowed to occur. The great progress that physicists have made in recent years in producing high vacuum in large spaces will contribute materially to the success of the new scheme.

If this new power production dream is realized, it will be a case of progress turning the clock back, in a sense. For the electrical machines that were used in the eighteenth-century by Benjamin Franklin and others were of the electrostatic type. They generated electricity by friction on large disks. All modern electrical generators and motors employ the principle of electromagnetics instead of electrostatics.

In the experiments with the ten million volt electrostatic generator already built, the accent has been upon its usefulness for producing artificial lightning to smash atoms and conduct research in physics. The commercial application of the scheme has been an objective about which there has been little discussion and still less definite announcement.

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## ARCHAEOLOGY

### Unearth Gold Mill of Ancient Mexican Indians

HERE did the ancient Mexican Indians get their huge supply of gold?

Millions of dollars' worth as bars and jewels left America for Spain right upon the heels of the Conquest. Yet little is known of its production.

The wealthy Aztec monarch, Montezuma, told Cortez that most of his supply came from Oaxaca and other parts of southern Mexico. The Conquistadores immediately investigated his story to find Indians busy panning gold in river sands there.

Practically all of the important gold mines in Mexico today, abandoned or producing, have traditions of having been exploited by Indians in pre-Spanish times. Stone tools are even found as evidence, some hundreds of feet in the mines.

Rock was apparently broken by heating and throwing on water, fire-marks being plentifully encountered. There also appears evidence that the ancient miners used burned lime, packing it into cracks and then expanding it by slackening with water. (Turn to page 409)

### VITALISM and MECHANISM A DISCUSSION between

HERBERT V. NEAL  
Professor of Zoology, Tufts College  
and

JAMES F. PORTER

Being a survey of these opposing theories from the point of view of a scientist and a layman.

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Yet modern experts usually deny that Indians were true "hard rock" miners. They claim that the Indians could not have utilized the ore. They had neither mercury nor cyanide with which to free the gold from the rock, it is argued, and were obliged to confine themselves to the river and possibly placer sands. The stone tools are explained as having been dropped in the mines by native workmen employed by the first Spaniards. The fire and lime are thought to have been used for "blasting" by the whites before gunpowder.

But now a "gold mill" has turned up in an old caved-in shaft in Oaxaca which would make the ancient Indians "hard rock" miners, after all. It consists of a 400-pound stone mortar and a 200-pound pestle. The pestle has two holes for inserting wooden handles, and was apparently manned by two operators.

With such implements, Oliver Powers, American mining engineer who found this "mill," points out that the Indians could have freed their gold from the rock by mechanical instead of the chemical means which they lacked. Ground to powder, the ore could have been panned.

Reasoning that if this had actually been the purpose of the mill, traces of rich ore might be found nearby, he searched and found a mass of it several yards away.

In further proof that this was a gold mill is the fact that its counterparts are used in remote parts of Oaxaca now by primitive Zapotec miners. They mill about a ton of ore a month.

As women commonly do all grinding in Mexico, Mr. Powers thought it likely that women also did this work in ancient times. He easily induced a pair of Zapotecan housewives to "man" his newly-found mill and show how it was done.

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GRINDING GOLD

GENETICS

## Internal Structure of Chromosomes Explored

**Scientists Find Net-Like Web or Honeycombed Structure Within the Band-Like Disks**

**C**HROMOSOMES, the heredity-bearing bits of living matter within cells, have had their internal structure explored to a new high point of detailed intimacy by Dr. C. W. Metz and Miss E. H. Gay, members of the research staff of the Carnegie Institution of Washington working in the laboratories of the Johns Hopkins University. They tell (*Science*, Dec. 21) of finding a net-like or honeycombed structure within or between the band-like disks, of which other scientists have recently shown the chromosomes to consist. (SNL, Sept. 29, Oct. 13, Nov. 10).

Dr. Metz and Miss Gay were impelled to undertake their research by observations made by other workers who have within the past few months made astonishing progress in the understanding of chromosomal makeup. Two earlier investigators who had seen these disks claimed that they frequently, if not always, occurred in pairs, with a clear space separating them. Within the past year, two other researchers had suggested that the genes did not lie within the dark disks themselves, but in the interdisk clear spaces. But the two ideas

were not correlated; it was not suggested that the genes lay in the clear spaces between paired disks.

With the idea of exploring the problem presented by the existence of the disks in pairs, Dr. Metz and Miss Gay examined chromosomes by a technique slightly different from that in current use among their colleagues in chromosome investigation. They found that what had seemed to be paired, thin, dark disks were really the opposite sides of thicker, "biscuit-like" or "wafer-like" bodies, hollow within and divided up into compartments with a network or honeycomb-like complex of protoplasmic strands or walls.

The cavities or "alveoli" thus formed appear in some of the new-found thick disks to have a more or less regular hexagonal pattern, and the strands which other workers have seen stretched between disks "like strings with beads on them" appear to be really the walls of these honeycomb cavities.

There are regional differences in the makeup of the chromosome substance, Dr. Metz and Miss Gay report. Each region appears to have a definite type

## ● R A D I O

Tuesday, January 8, 4:30 p. m.

**STELLAR GUESTS**, by Dr. Fritz Zwicky, of the California Institute of Technology.

In the Science Service series of radio addresses given by eminent scientists over the Columbia Broadcasting System.

of protoplasmic structure, which usually extends across the chromosome at that level. The type may change abruptly in passing from one region to another. In some places the protoplasm appears to have a smooth, undifferentiated structure, in others it is full of large or small cavities.

The two Carnegie Institution workers suggest that there may be qualitative chemical differences associated with the differences in structure.

Some months ago, one of the other investigators likened the disk-like structures to "temples of destiny" on the "streets" of heredity which are the chromosomes. If the analogy is to be pursued further, the inter-disk cavities found by Dr. Metz and Miss Gay might be called the rooms within the temples.

But as yet nobody has actually seen the powerful controlling goddesses who dwell in these rooms, the modern Fates, otherwise the Genes.

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#### ARCHAEOLOGY

### Swedish Unemployed Rebuild Castle

WITH funds provided by the Swedish government, unemployed workers of Sweden are busily raising the walls and towers of historic Bohus Castle, of medieval fame.

Ruins of the castle have long been a landmark to travelers approaching Gothenburg from the sea. That the ancient stronghold was a center of Scandinavian military history from the time of the Middle Ages, has been familiar fact. Now the secrets of the castle, its dungeons, powerful fortifications, and stately vaulted baronial halls, are being uncovered by the relief workers.

In one tower, a small museum has been improvised by the archaeologists.

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## In Science Fields

#### PALEONTOLOGY

### Idaho Had its Rabbits 5,000,000 Years Ago

JACKRABBITS loped in Idaho five million years ago as they lope there today. Evidence to this end is presented by Dr. C. Lewis Gazin, in a new technical publication of the U. S. National Museum. Dr. Gazin describes four fossil hare species, three of them new, from the late pliocene, the geologic period preceding the last ice age.

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#### GEOLGY

### Oregon's Famous Crater Lake Not 1,000 Years Old

See Front Cover

BLUE Crater Lake, in the national park of that name, at last has divulged the secret of its age. Not all at once, however. A few facts it revealed to the geologist, a few more to the student of tree rings, others to the engineer. Putting two and two together, these various specialists have come to the conclusion that Crater Lake is young, not yet a thousand years old.

Crater Lake lies in a great volcanic crater, and from the floor of this crater rise two islands, results of the last puffs of volcanic action. One of these, Wizard Island, is a small volcano. On its shoulders it bears a mantle of tree life, the first that ever grew there, according to scientists. By counting the annual rings on cores of wood bored out of these trees, Dr. W. G. Vinal has found some of them to be nearly 800 years old.

Since observations by scientists and others of various volcanoes show that only a few years elapse between the

cessation of eruptions and the growth of plant life on volcanic slopes, it is estimated that the probable cessation of volcanic activity on Wizard Island occurred some 900 to 1,200 years ago. Since the rocks of the island do not show the characteristics of lava that has flowed into or through water, it is believed that the lake is younger than the island, or well under 1,000 years.

It is estimated that the lake, which now has an average depth of 1,500 feet, was built up to its present level over a period of 730 years. This estimate is based on the average annual precipitation of 70 inches at Crater Lake, an average evaporation of 50 inches a year, and an average of ten inches of precipitation lost through seepage. These figures are based on an average of rainfall and evaporation equaling the average of the past 50 years.

At present a balance appears to have been reached between precipitation on the one hand and evaporation and seepage on the other.

The lake, which has a diameter of six miles, lies 1,000 feet below the level of its volcanic rim.

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#### CHEMISTRY

### Chemists Honor Discoverer Of Artificial Rubber

FATHER Julius A. Nieuwland, professor of organic chemistry at the University of Notre Dame, has been awarded the William H. Nichols medal of the New York section of the American Chemical Society. The honor, it is announced by the award committee, is for his "basic work on syntheses from unsaturated hydrocarbons." This means simply, Father Nieuwland's decade of research on artificial rubber.

Working on reactions possible with acetylene—the gas used in welding torches and in old-fashioned automobile headlights—Father Nieuwland made discoveries which subsequent research utilized in making the synthetic rubber known as duprene.

Duprene, while having the elastic properties of natural rubber, is highly resistant to the action of gasoline and other rubber solvents as the natural product is not.

While artificial rubber cannot be

made as cheaply, at present, as natural rubber can be produced, the synthetic rubber products of the duprene type serve as a valuable check to control the price.

During wartime and by means of special cartels rubber has often sold as high as \$1.25 a pound. Now it is said that the cartels dare not raise the price of natural rubber above 20 cents a pound.

Based on America's annual consumption of rubber, it is estimated that 375 million dollars a year is saved due to the difference in the present price of rubber and what it might be if there were no artificial competitor at hand to serve as a check against price-rising.

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ZOOLOGY

## German Breeders "Rebuild" Lost Wild Horse Species

BREEDING experiments conducted at the Munich Zoological Garden have succeeded in producing a young horse resembling in every respect one of the two extinct horse species that roamed Germany when the country was still a wilderness. (*Die Umschau Dec. 9*).

The Munich animal is a cross between the still-existing brown wild horse of the Siberian steppes and a descendant of the gray "tarpan" of southern Russia, extinct in its pure line since 1879. In both juvenile and adult coat colors and markings the "rebuilt" wild horse is said to be an exact counterpart of its vanished forebears.

At the same zoological park, success is announced in "rebuilding" the aurochs, a species of wild cattle abundant in Europe during ancient and medieval times, but extinct since the seventeenth century.

The results of these breeding experiments are discussed by Dr. H. W. Frickhinger of Berlin.

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BOTANY

**NATURE RAMBLINGS**  
by Frank Thone



### Phenology

GET SET to add another word to your vocabulary: Phenology.

Don't object that it is a "big word." It is no tougher than a lot of other scientific terms that are already part of your unconscious, fluent talking equipment, like distillation, crystallize, nebula, electron and chromosome. The first dozen times are the hardest.

Phenology is a gift of science's partnership with the New Deal. It has nothing to do with phrenology, which is a thoroughly exploded Old Deal word, nor with penology, which has to do with the prison-fate of public enemies under both the New Deal and the Old. Phenology is a convenient word meaning the study of when the flowers bloom in springtime and the fruits get ripe in fall. We have all been informal practitioners of this science all our lives; only we are now to have a handy name for it.

Phenology is given a good deal of attention in the just-published report of the Land-Use Committee of President Roosevelt's Science Advisory Board. It is of especial importance in the rehabilitation of the now depleted grasslands of the West, which must be better managed in future if we are to have beefsteaks to eat and woolen overcoats to wear.

For one of the reasons why the grasslands have been worn dangerously thin is that cattle and sheep have been grazed on them in unscientific disregard of the seasons. If they are eaten down when they are in bloom, or while the seed is still green and unshed, the animals are apt to eat not only this year's pasture but next year's unborn

grass. Their present hunger may bring them future starvation.

Phenology, in the hands of competent practical botanists, can do much to abate this danger. Such scientists will be able to say, for a given region, when the stock may be turned out to graze unrestricted, and when they should be held in the corrals yet a while, to give their dinner a chance to get ripe. They will be able to tell the stockmen when to look out for the ripening of poisonous seeds or the hardening of irritating thorns and prickles on the range-land weeds. They will know which grasses are perennials, not so much dependent on seeds, and which are annuals, which absolutely must be allowed to propagate year by year. They will have the answers to many questions which in the past have cost the livestock industry many millions because men guessed instead of knowing.

Phenology is not a new word. It has been in technical use for a long time, and even now is in popular use in British agricultural publications. It comes from the Greek, meaning the study of appearance—in this case the appearance of the flowers, fruits and seeds.

The same Greek root is in one of our familiar Christmas-season words, Epiphany, the feast commemorating the visit of the Three Wise Men. "Phaeno" in Greek means to show: Epiphany was the "showing" of the Child of Bethlehem to the world at large, as represented by Caspar, Melchior and Balthazar.

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# •First Glances at New Books

## Biography

THE WORLD AS I SEE IT—Albert Einstein—*Covici-Friede*, 290 p., \$2.50. Selected writings of Prof. Einstein so chosen as to paint the word picture of Einstein the man. The first half of the book consists of various addresses and papers on science and relativity prepared for lay audiences and readers. The last half deals with Prof. Einstein's convictions on Judaism, world politics and peace, and the collection of correspondence relating to his resignation from the Prussian Academy of Science following the ascension of Nazism in Germany.

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## Botany

PHOTOTROPIC SENSITIVITY IN RELATION TO WAVELENGTH—Earl S. Johnston—*Smithsonian Institution*, 17 p., 2 pl., 10c. Using oat seedlings as sensitive indicators, Dr. Johnston found two wavelength bands of maximum effectiveness in causing bending, at 4400 Å and 4700-4800 Å respectively.

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## Standards

BOOK OF A. S. T. M. STANDARDS, 1934—*American Society for Testing Materials*, 1257 p., paper, \$7.00; cloth, \$8.00.

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## Ecology

THE LIFE FORMS OF PLANTS AND STATISTICAL PLANT GEOGRAPHY—C. Raunkiaer—*Clarendon Press*, 632 p., 189 figures, \$14. Students of plant ecology, and botanists generally, will welcome this one-volume collection, in English, of the works of one of the great masters of their craft. Raunkiaer's classification of plants by life forms, and his demonstration of the relation of these to geographic distribution, are among the most clarifying of modern ecological concepts.

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## Zoology

CONFessions OF A SCIENTIST—Raymond L. Ditmars—*Macmillan*, 241 p., \$3.50. He who lives in a great city of varied inhabitants will have many interesting experiences; but when he lives in the city that is the modern zoological garden, filled with such diverse folk as vampire bats, mambas

and tarantulas, he has material for stories that would make even Sindbad gasp—especially when he can add thereto the many curious reactions of the biped animals outside the cages.

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## Physics

THE NEW BACKGROUND OF SCIENCE (Revised edition)—Sir James Jeans—*Macmillan*, 312 p., \$2.50. Second edition of the book which first appeared in 1933. The major change has been to incorporate the necessary revisions caused by the discovery of the neutrons and positrons as constituents of the atom.

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## Physical Education

PHYSICAL EDUCATION FOR THE ELEMENTARY SCHOOL CLASSROOM—Robert C. Rice—*Burgess Pub. Co.*, 31 p., mimeographed, \$1.35. This book gives detailed and illustrated directions for teaching physical education in classrooms designed for academic subjects and having little or no athletic equipment.

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## Photography

THE AMERICAN ANNUAL OF PHOTOGRAPHY, 1935—*American Photographic Publishing Company*, 298 p., \$1.50 paper, \$2.25 cloth. Last minute articles on photographic technique combined with the customary beautiful collection of photographs from all over the world.

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## Science

PROCEEDINGS AND SCIENTIFIC PAPERS, FIFTH PACIFIC SCIENCE CONGRESS, June, 1933. 5 volumes—*University of Toronto Press*, \$20 for set. Includes 500 scientific papers presented at the Congress which met at Victoria and Vancouver under the auspices of the National Research Council of Canada in June, 1933.

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## Marine Biology

HALF MILE DOWN—William Beebe—*Harcourt, Brace*, 344 p., \$5. The "deepest down divin'est, longest under stayin'est" of contemporary American naturalists takes us all for a ride in his bathysphere. This book, with its vivid descriptions and its many equally vivid illustrations, will undoubtedly be found in many a Christmas stocking this year.

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## Engineering

THE MECHANICS OF ENGINEERING—S. D. Chambers—*Macmillan*, 279 p., \$3.50. A college text covering the essentials of statics and kinetics written by the associate professor of applied mechanics at Purdue University.

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## Ornithology

CATALOGUE OF BIRDS OF THE AMERICAS: PART VII—Charles E. Hellmayr—*Field Museum of Natural History*, 531 p., \$4. The newest addition to this notable catalogue, covering Corvidae, Troglodytidae and Turdidae, with nine other smaller families. Of interest principally to professional ornithologists.

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## Mathematics

SELECTED TOPICS IN ALGEBRAIC GEOMETRY—II—Supplemental Report of the Comm. on Rational Transformations—*National Research Council*, 84 p., \$1.00.

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## Radio

BROADCAST RECEIVER DESIGN—G. S. Granger, 36 p., 50c.; ALL-WAVE RECEIVER DESIGN—G. S. Granger, 29 p., 50c.; HIGH-FIDELITY RECEIVER DESIGN—G. S. Granger, 31 p., 50c.; Set of three, \$1.—*Manson Publishing Co.*, New York.

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## Physics

ELECTROLYTES—Hans Falkenhagen, translated by R. P. Bell—*Oxford*, 336 p., \$9.50. Technical volume on theory of electrolytes. The book is based on the plan suggested by Prof. P. Debye.

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